Lecture Notes in Networks and Systems 149

Prasant Kumar Pattnaik
Mangal Sain
Ahmed A. Al-Absi
Pardeep Kumar *Editors*

Proceedings of International Conference on Smart Computing and Cyber Security

Strategic Foresight, Security Challenges and Innovation (SMARTCYBER 2020)

Springer

Lecture Notes in Networks and Systems

Volume 149

The series “Lecture Notes in Networks and Systems” publishes the latest developments in Networks and Systems—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNNS.

Volumes published in LNNS embrace all aspects and subfields of, as well as new challenges in, Networks and Systems.

The series contains proceedings and edited volumes in systems and networks, spanning the areas of Cyber-Physical Systems, Autonomous Systems, Sensor Networks, Control Systems, Energy Systems, Automotive Systems, Biological Systems, Vehicular Networking and Connected Vehicles, Aerospace Systems, Automation, Manufacturing, Smart Grids, Nonlinear Systems, Power Systems, Robotics, Social Systems, Economic Systems and other. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution and exposure which enable both a wide and rapid dissemination of research output.

The series covers the theory, applications, and perspectives on the state of the art and future developments relevant to systems and networks, decision making, control, complex processes and related areas, as embedded in the fields of interdisciplinary and applied sciences, engineering, computer science, physics, economics, social, and life sciences, as well as the paradigms and methodologies behind them.

Indexed by SCOPUS, INSPEC, WTI Frankfurt eG, zbMATH, SCImago.

All books published in the series are submitted for consideration in Web of Science.

More information about this series at http://www.springer.com/series/15179

Prasant Kumar Pattnaik · Mangal Sain ·
Ahmed A. Al-Absi · Pardeep Kumar
Editors

Proceedings of International Conference on Smart Computing and Cyber Security

Strategic Foresight, Security Challenges and Innovation (SMARTCYBER 2020)

Springer

Editors
Prasant Kumar Pattnaik
School of Computer Engineering
Kalinga Institute of Industrial Technology
KIIT Deemed to be University
Bhubaneswar, India

Mangal Sain
Division of Information and Communication Engineering
Dongseo University
Busan, Korea (Republic of)

Ahmed A. Al-Absi
Department of Smart Computing
Kyungdong University Global Campus
Gangwondo, Korea (Republic of)

Pardeep Kumar
Department of Computer Science
Swansea University, Bay Campus
Swansea, UK

ISSN 2367-3370 ISSN 2367-3389 (electronic)
Lecture Notes in Networks and Systems
ISBN 978-981-15-7989-9 ISBN 978-981-15-7990-5 (eBook)
https://doi.org/10.1007/978-981-15-7990-5

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

The 1st International Conference on Smart Computing and Cyber Security—Strategic Foresight, Security Challenges and Innovation (SMARTCYBER 2020), took place in Kyungdong University Global Campus, Gosung, Gangwondo, South Korea, during July 7–8, 2020. It was hosted by the Department of Smart Computing, Kyungdong University, Global Campus, South Korea.

The SMARTCYBER is a premier international open forum for scientists, researchers and technocrats in academia as well as in industries from different parts of the world to present, interact and exchange the state of the art of concepts, prototypes, innovative research ideas in several diversified fields. The primary focus of the conference is to foster new and original research ideas and results in the five board tracks: smart computing concepts, models, algorithms, and applications, smart embedded systems, bio-Inspired models in information processing, technology, and security. This is an exciting and emerging interdisciplinary area in which a wide range of theory and methodologies are being investigated and developed to tackle complex and challenging real-world problems. The conference includes invited keynote talks and oral paper presentations from both academia and industry to initiate and ignite our young minds in the meadow of momentous research and thereby enrich their existing knowledge.

SMARTCYBER 2020 received a total of 143 submissions. Each submission was reviewed by at least three Program Committee members. The committee decided to accept 37 full papers. Papers were accepted on the basis of technical merit, presentation and relevance to the conference. SMARTCYBER 2020 was enriched by the lectures and insights given by the following seven distinguished invited speakers: Prof. Prasant Kumar Pattnaik, School of Computer Engineering, Kalinga Institute of Industrial Technology; Professor Ana Hol, Western Sydney University, Australia; Professor Aninda Bose, Senior Editor Springer India; Prof. Evizal Abdul Kadir, UIR, Indonesia; Dr. James Aich S, CEO Terenz Co. Ltd, South Korea; Prof. Mangal Sain, Dongseo University, South Korea; and Prof. Ahmed A. Al-Absi, Kyungdong University Global Campus, South Korea. We thank the invited speakers for sharing the enthusiasm for research and accepting our invitation to share their expertise as well as contributing papers for inclusion in the proceedings.

SMARTCYBER 2020 has been able to maintain standards in terms of the quality of papers due to the contribution made by many stakeholders.

We are thankful to the General Chairs, Prasant Kumar Pattnaik, KIIT Deemed to be University, India; Ahmed A. Al-Absi, Kyungdong University, South Korea; Mangal Sain, Dongseo University. We futher thank the Program Chairs, Baseem Al-athwari, Kyungdong University Global Campus, South Korea; Pardeep Kumar, Swansea University, UK; Deepanjali Mishra, KIIT Deemed to be University, India, for their guidance and valuable inputs.

We are grateful to Prof. John Lee, President of Kyungdong University (KDU) Global Campus, South Korea, and Honorary General Chair, SMARTCYBER 2020, for his constant support and for providing the infrastructure and resources to organize the conference. We are thankful to Prof. Sasmita Rani Samanta, Pro-Vice-Chancellor, KIIT Deemed to be University, India, Honorary General Chair, SMARTCYBER 2020, for providing all the support for the conference.

Thanks are due to the Program and Technical committee members for their guidance related to the conference. We would also like to thank the Session Management Chairs, Publications Chairs, Publicity Chairs, Organizing Chairs, Finance Chairs and Web Management Chair who have made an invaluable contribution to the conference. We acknowledge the contribution of EasyChair in enabling an efficient and effective way in the management of paper submissions, reviews and preparation of proceedings. Finally, we thank all the authors and participants for their enthusiastic support. We are very much thankful to entire team of Springer Nature for timely support and help. We sincerely hope that you find the book to be of value in the pursuit of academic and professional excellence.

Bhubaneswar, India — Prasant Kumar Pattnaik
Gangwondo, Korea (Republic of) — Ahmed A. Al-Absi
Busan, Korea (Republic of) — Mangal Sain
Swansea, UK — Pardeep Kumar

Contents

Editors and Contributors

About the Editors

Prasant Kumar Pattnaik Ph.D. (Computer Science), Fellow IETE, Senior Member IEEE, is a Professor at the School of Computer Engineering, KIIT Deemed University, Bhubaneswar. He has more than a decade of teaching and research experience and awarded half dozen of Ph.D. Dr. Pattnaik has published numbers of research papers in peer-reviewed international journals and conferences and filed many patents. He also edited book volumes in Springer and IGI Global Publication. His areas of interest include mobile computing, cloud computing, cyber security, intelligent systems, and brain–computer interface. He is one of the Associate Editors of Journal of Intelligent & Fuzzy Systems, IOS Press, and Intelligent Systems Book Series Editor of CRC Press, Taylor Francis Group.

Mangal Sain received the Master of Application degree from India in 2003 and the Ph.D. degree in Computer Science from Dongseo University, Busan, South Korea, in 2011. Since 2011, he has been an Assistant Professor with the Department of Information and Communication Engineering, Dongseo University, Busan, South Korea. He has published over 40 international publications. His current research interests include wireless sensor network, middleware, cloud computing, embedded system, and the Internet of Things. He is a member of TIIS and has participated as a TPC member in several international conferences.

Ahmed A. Al-Absi Ph.D (Computer Science), is an Associate Professor at the Smart Computing Department, Kyungdong University Global Campus, South Korea. He is currently Dean of International Faculty and Director of Global Academic Collaboration Centers at Kyungdong University Global. He has more than ten years of experience in teaching and university lecturing in the areas of database design and computer algorithms. Dr. Al-Absi has published numbers of research papers in peer-reviewed international journals and conferences. His research areas are Big Data, Large Scale Data Process Systems, Cloud Computing, IoT, VANET, Deep Learning, Parallel Computing, Security, and Bioinformatics. His professional experience includes being a speaker at a number of renowned research conferences and technical meetings such as IEEE, Korea ICT leaders forum, and reviewer for refereed journals and conferences on data-intensive computing as well as an examiner for postgraduate scholars in his research areas.

Pardeep Kumar received the B.E. degree in Computer Science from Maharishi Dayanand University, Haryana (India), in 2002, the M.Tech. degree in Computer Science from Chaudhary Devi Lal University, Haryana (India), in 2006, and the Ph.D. degree in Ubiquitous Computing from Dongseo University, Busan (South Korea) in 2012. He is currently a Lecturer/Assistant Professor with the Department of Computer Science, Swansea University, Swansea, UK. From 2012 to 2018, he had held postdoc positions at the Department of Computer Science, Oxford University, Oxford UK (08/2016–09/2018), at the Department of Computer Science, The Arctic University of Norway, Tromso, Norway (08/2015–08/2016), and at Centre for Wireless Communications and the Department of Communications Engineering, University of Oulu, Finland (04/2012 to 08/2015).

Contributors

Satyabrata Aich Terenz Co., Ltd., Busan, Republic of Korea

Ahmed A. Al-Absi International Faculty (Academic), Global Academic Collaboration Centers, Kyungdong University-Global Campus, Wonju-si, South Korea

Ahmed Abdulhakim Al-Absi Dean of International Faculty (Academic), Director of Global Academic Collaboration Centers, Kyungdong University, Yangju, South Korea;
Department of Smart Computing, Kyungdong University, Bongpo, Gosung, Gangwondo, Republic of Korea

Mohammed Abdulhakim Al-Absi Department of Computer Engineering, Dongseo University, Sasang-gu, Busan, Republic of Korea

Baseem Al-athwari Smart Computing Department, Kyungdong University, Goseong-gun, Gangwon-do, South Korea;
Department of Computer Engineering, Kyungdong University, Global Campus (Goseong), Goseong, Gangwon-do, Republic of Korea

Amrizal Amrizal Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

S. Aravinthkumar SRM University, Sonepat, India

Kurnia Rina Ariani Muhammadiyah Surakarta University, Surakarta, Indonesia

Wafa Arsalane Jeonbuk National University, Jeonju, South Korea

Yudhi Arta Department of Informatics Engineering, Faculty of Engineering, Universitas Islam Riau, Pekanbaru, Indonesia

Hossain Md Azam Smart Computing Department, Kyungdong University, Goseong-gun, Gangwon-do, South Korea

Bimantara Department of Informatics Engineering, Faculty of Engineering, Universitas Islam Riau, Pekanbaru, Indonesia

Sabyasachi Chakraborty Department of Computer Engineering, Inje University, Gimhae, South Korea;
Terenz Co., Ltd., Busan, Republic of Korea

Ajayveer Singh Chandel VIT University, Vellore, India

Chiwoon Cho School of Industrial Engineering, University of Ulsan, Ulsan, Republic of Korea

Daehyoun Choi School of Industrial Engineering, University of Ulsan, Ulsan, Republic of Korea

Olivia Fachrunnisa Department of Management, Faculty of Economics, Universitas Islam Sultan Agung, Semarang, Indonesia

Muhamad Haddin Electrical Engineering, Universitas Islam Sultan Agung, Semarang, Indonesia

Ari Hanggara Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Ana Hol School of Computer, Data and Mathematical Sciences, Western Sydney University, Rydalmere, NSW, Australia

Md Azam Hossain Department of Computer Engineering, Kyungdong University, Global Campus (Goseong), Goseong, Gangwon-do, Republic of Korea

Soonwook Hwang Korea Institute of Science and Technology Information (KISTI), Daejeon, Republic of Korea

Dian Indriani Informatics Engineering, Universitas Islam Riau, Riau, Indonesia

Eugene Istratova Department of Automated Control Systems, Novosibirsk State Technical University, Novosibirsk, Russia

Ju Jinquan Department of Computer Engineering, Dongseo University, Sasang-gu, Busan, Republic of Korea

Evizal Abdul Kadir Department of Informatics Engineering, Faculty of Engineering, Universitas Islam Riau, Pekanbaru, Indonesia

Ahmadhon Kamolov Department of Computer Engineering, Dongseo University, Busan, Republic of Korea

Sanghoon Kang Department of Electronic Engineering, Pukyong National University, Busan, South Korea

Jik-soo Kim Department of Computer Engineering, Myongji University, Yongin, Republic of Korea

Ki-Hwan Kim Department of Computer Engineering, Dongseo University, Busan, Republic of Korea;
Department of Ubiquitous IT, Dongseo University, Busan, Republic of Korea

Jeongseok Kim Department of Electrical and Computer Engineering, University of Seoul, Seoul, South Korea;
Security Labs, AIX Center, SK Telecom, Seoul, South Korea

Neeraj Kumar VIT University, Vellore, India

Sandra Kumi Department of Computer Engineering, Dongseo University, Busan, South Korea

Novendra Kurniadi Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Hoon Jae Lee Division of Computer Engineering, Dongseo University, Busan, Republic of Korea;
Division of Information and Communication Engineering, Dongseo University, Sasang-gu, Busan, Republic of Korea

Jaeho Lee Department of Electrical and Computer Engineering, University of Seoul, Seoul, South Korea

Sang-Gon Lee Department of Computer Engineering, Dongseo University, Busan, South Korea

ChaeHo Lim BITSCAN Co., Ltd., Seoul, South Korea

Shreya Makkar VIT University, Vellore, India

P. Manjula SRM University, Sonepat, India

Winda Monika Library Science, Universitas Lancang Kuning, Riau, Indonesia

Ojasvita Muyal VIT University, Vellore, India

Akshay Nagpal VIT University, Vellore, India

Arbi Haza Nasution Informatics Engineering, Universitas Islam Riau, Riau, Indonesia

Salhazan Nasution Informatics Engineering, Universitas Riau, Riau, Indonesia

MD. Nur Alam Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, South Korea

M. D. Nur Alam Department of Smart Computing, Kyungdong University, Bongpo, Gosung, Gangwondo, South Korea

Yuli Nurhasanah Department of Management, Faculty of Economics, Universitas Islam Sultan Agung, Semarang, Indonesia

Yustus Oko Oktian Department of Computer Engineering, Dongseo University, Busan, South Korea

Otabek Olimjonov Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, South Korea

Hanhoon Park Department of Electronic Engineering, Pukyong National University, Busan, South Korea

Jinse Park Department of Neurology, Haeundae Paik Hospital, Inje University, Busan, Republic of Korea

Jong-Il Park Department of Computer Science, Hanyang University, Seoul, South Korea

Prasant Kumar Pattnaik School of Computer Engineering, KIIT University, Bhubaneswar, India

Dita Prameswari Department of Management, Faculty of Economics, Universitas Islam Sultan Agung, Semarang, Indonesia

Sri Arttini Dwi Prasetyowati Electrical Engineering, Universitas Islam Sultan Agung, Semarang, Indonesia

Gustita Arnawati Putri Veteran Bangun Nusantara Sukoharjo University, Kabupaten Sukoharjo, Indonesia

Tilak Rasaili Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, South Korea

Happy Rhemananda Department of Management, Faculty of Economics, Universitas Islam Sultan Agung, Semarang, Indonesia

Fu Rui Department of Computer Engineering, Dongseo University, Busan, Republic of Korea

Hind R'bigui School of Industrial Engineering, University of Ulsan, Ulsan, Republic of Korea

Mangal Sain Division of Computer Engineering, Dongseo University, Busan, Republic of Korea;
Division of Information and Communication Engineering, Dongseo University, Sasang-gu, Busan, Republic of Korea

Dahit Santosh Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, Republic of Korea

Mohammad Ibrahim Sarkar Department of Electronic Engineering, Chonbuk National University, Deokjin-gu, Jeonju-si, Jeollabuk-do, Republic of Korea

Jay Sarraf School of Computer Engineering, KIIT University, Bhubaneswar, India

Shahi Saugat Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, Republic of Korea

Panji Rachmat Setiawan Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Dima Roulina Simbolon Department of Management, Faculty of Economics, Universitas Islam Sultan Agung, Semarang, Indonesia

Dina Sin Department of Construction, Technical Oil and Gas Institute, Sakhalin State University, Yuzhno-Sakhalinsk, Russia

Apri Siswanto Department of Informatics Engineering, Faculty of Engineering, Universitas Islam Riau, Pekanbaru, Indonesia

Konstantin Strokin Department of Construction, Technical Oil and Gas Institute, Sakhalin State University, Yuzhno-Sakhalinsk, Russia

Des Suryani Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Nesi Syafitri Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Abdul Syukur Department of Informatics, Universitas Islam Riau, Pekanbaru, Indonesia

Rakesh Thapamagar Department of Smart Computing, Kyungdong University, Gosung, Gangwondo, South Korea

Obhi Thiessaputra Electrical Engineering, Universitas Islam Sultan Agung, Semarang, Indonesia

Gabit Tolendiyev Department of Computer Engineering, Dongseo University, Busan, Republic of Korea

Ihsan Ullah Department of Robotics Engineering, Daegu Gyeonbuk Institute of Science and Technology, Daegu, South Korea

Vaibhaw School of Computer Engineering, KIIT University, Bhubaneswar, India

Ariyani Wahyu Wijayanti Veteran Bangun Nusantara Sukoharjo University, Kabupaten Sukoharjo, Indonesia

Elizabeth Nathania Witanto Department of Computer Engineering, Dongseo University, Busan, South Korea

Implementation of Motorcycle Monitoring Using Bluetooth with an Android-Based Microcontroller Using Arduino

Yudhi Arta, Evizal Abdul Kadir, Ari Hanggara, Des Suryani, and Nesi Syafitri

Abstract Vehicle safety at this time is a priority that must be considered by the motorcycle manufacturer. For this security, it now needs a system that works systematically and uses the latest technological devices. The system offered for current technology is an Arduino microcontroller and is also based on android to design an engine control system ON/OFF on a motorcycle by using android via Bluetooth which can control the engine remotely or close. This equipment data communication protocol is via Bluetooth installed on the device motorcycle using 6 or 12 volts to ignition systems, starters, lights, and other electrical components. The distance generated by this Bluetooth device also needs to be calculated so that there is an estimation of the distance and the length of the data generated both for near and far scale. This equipment has been tested and can be used to control the engine on a motorcycle from a distance or near without having to go through the contact of a motorcycle installed.

Keywords Arduino · Android · Microcontroller · Bluetooth

Y. Arta (✉) · E. A. Kadir · A. Hanggara · D. Suryani · N. Syafitri
Department of Informatics, Universitas Islam Riau, Kaharuddin Nasution Street 117, Pekanbaru, Indonesia
e-mail: yudhiarta@eng.uir.ac.id

E. A. Kadir
e-mail: evizal@eng.uir.ac.id

A. Hanggara
e-mail: arihanggara@eng.uir.ac.id

D. Suryani
e-mail: des.suryani@eng.uir.ac.id

N. Syafitri
e-mail: nesisyafitri@eng.uir.ac.id

P. K. Pattnaik et al. (eds.), *Proceedings of International Conference on Smart Computing and Cyber Security*, Lecture Notes in Networks and Systems 149,
https://doi.org/10.1007/978-981-15-7990-5_15

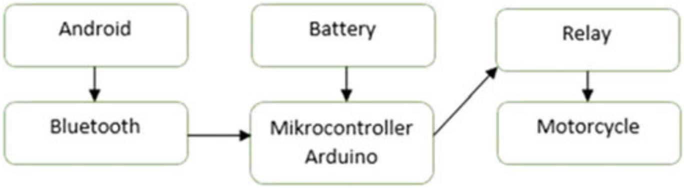


Fig. 1 Block diagram of a motorcycle control system

1 Introduction

At present, motorcycle is typically a possible means of local transportation that is widely used in everyday life. With the development of bicycle technology at this time, the need for a security system on motorbikes is a much-needed requirement for motorcycle owners. Many security systems are offered and used by consumers at this time in the form of non-electric and electric safety, such as handlebar locks, padlock, and the alarm that uses sound as an indicator which is the standard security of an alarm and others. [1].

On the other hand, technological advances are increasingly rapid, so that almost every individual already has a gadget, both in the form of smartphones and tablets [2]. Now smartphones are a special device for everyone because of the importance of their function as a medium of communication and information that can be accessed instantly wherever and whenever. Therefore, smartphones are always carried by everyone [3]. For this reason, the author tries to improve the functionality of a smartphone which is usually only used as a communication tool so that it can be used as a media control device [4].

For many security systems that have been created only use the RFID system. This system makes RFID work as security verification on motorbikes. Then, RFID reads the code and some other numeric so that when an RFID tag responds to an RFID reader it can read the data stored in the tag and send this data to be compared with the data in the database. In the case of information reading from the wrong tag, conditions are recorded in the database [5].

The security system for vehicle users is easy to save in all gadget devices, saving in terms of cost and practicality. This system utilizes the development of smartphones and Arduino technology as a communication tool and single-board microcontroller that has experienced many developments nowadays, such as motorbike controllers combined with microcontroller components and utilizing Arduino and Bluetooth facilities available on android smartphones [6–8].

2 Architecture Design

In this design in Fig. 1, at this stage, the thing that needs to be done is by inputting the control application that is available on the android smartphone device. In the application, standard input (button ON/OFF) is available to be used. Data sent from an android smartphone will be received by a Bluetooth module connected to the Arduino microcontroller system. The serial data is translated by the Arduino microcontroller into parallel data [9]. Parallel data generated by the Arduino microcontroller is forwarded to the relay via the LED indicator which functions to turn off the motorcycle. Then, the relay will forward the data used to turn on or turn off the vehicle [10].

2.1 Motor Starter System Components

The motor starter system has several components including

- The battery is an electrochemical device that is made to supply low-voltage electrical energy (on motorbikes using 6 volts or 12 volts) to ignition systems, starters, lights, and other electrical components. Batteries store electricity in the form of chemical energy, which is released when needed according to the load and system that needs it.
- Ignition key serves as the main switch to connect and disconnect (on/off) the motorbike electrical circuit.
- Relay starter is the main relay of the starter system which serves to reduce the voltage loss that is supplied from the battery to the starter motor.
- The starter switch functions as a motorbike starter switch that works when the key is in the ON position.
- The starter motor is an electric starter that functions to convert the battery's chemical power into a rotary power that is capable of rotating the crankshaft to start the engine (Fig. 2).

The start engine on this motor is made using Arduino Uno as the main part of the program using the Arduino 1.8.4 software. In Fig. 3, tools such as the Bluetooth HC-05 module, Relay, and jumper cables then installed on the electrical part of the motorcycle. The essence of making a system on this motorbike is to make it easier for humans to improve the safety of a motorcycle without using a key so that it only uses an android smartphone. The development of the system in this motorbike requires several stages of analysis that must be passed; at this stage, modeling is done using flowcharts and coupling on Arduino. For the design of the tool, we will use several stages including:

- Designing a tool by assembling a relay to an Arduino using a jumper cable.
- Installing the Bluetooth HC-5 module into Arduino using a jumper cable.
- Programming Arduino on software using Arduino 1.8.5.

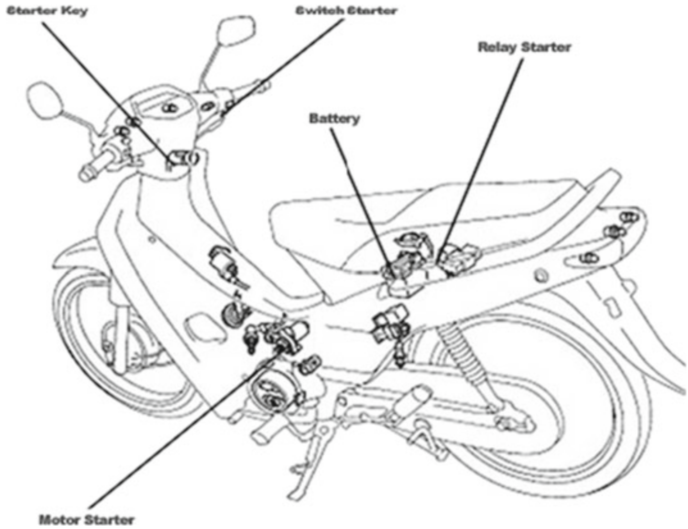
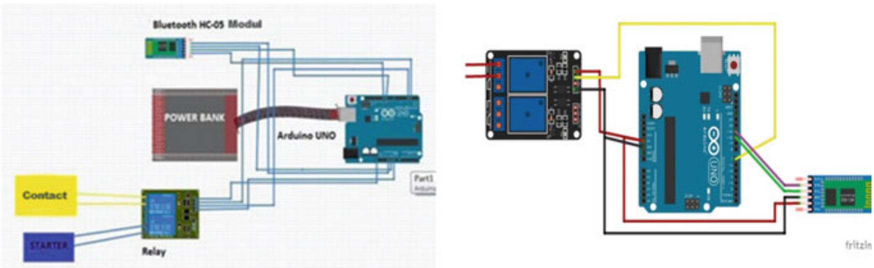


Fig. 2 Design motorcycle control system



(a) (b)

Fig. 3 Arduino module design **a** top and **b** bottom views

- Installation of electric motors.

2.2 Design of Blocks Using App Inventor

The design of the android application design block with the inventor app works so that the application can function properly. The design block of the inventor app is also enabled so that the application can be connected to Arduino and can be used according to the functions of the application, while the blocks made can be seen in Fig. 4.

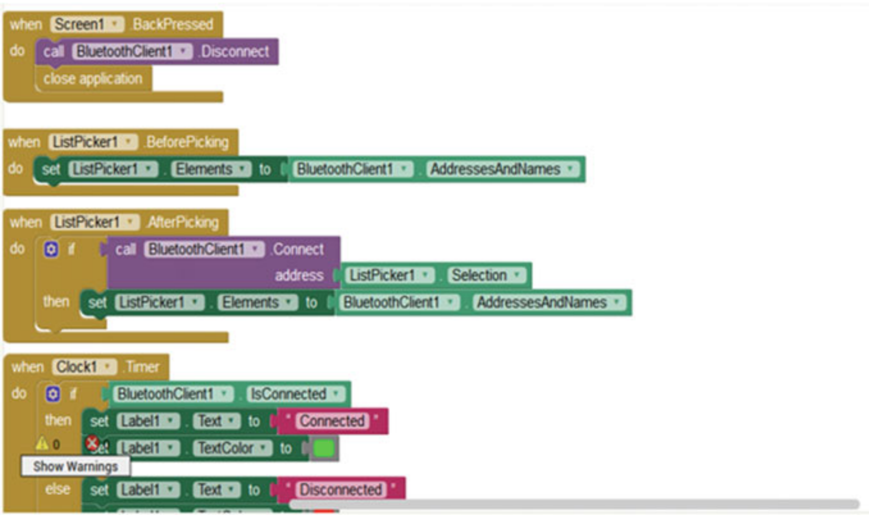


Fig. 4 Designing application design blocks using app inventor

A list of Bluetooth devices connected to android can be taken as a reference address. In Fig. 5, before being used, the 'ListPicker' element is used as an available Bluetooth list container. If the items in the list have been selected, the procedure 'BluetoothClient1' will be called with the selected address variable.

In Fig. 5, with the help of 'clock.Timer,' each time interval is checked when data is received via Bluetooth and then takes it with the function 'Label1.' But, the above functions have several disadvantages, namely

- The data received is not parsed, so any data received is a string of strings.
- If in a one-time interval some data is received, then the data is considered a unit.
- If the process of sending data takes place when a timer interruption occurs, then the data will be truncated (data is not intact).

3 Result and Discussion

This test is done to see whether the system is good or not when it is used. This test uses two motorbikes as a test medium and tested 10 times repeatedly. This is done so that testing can produce more accurate data.

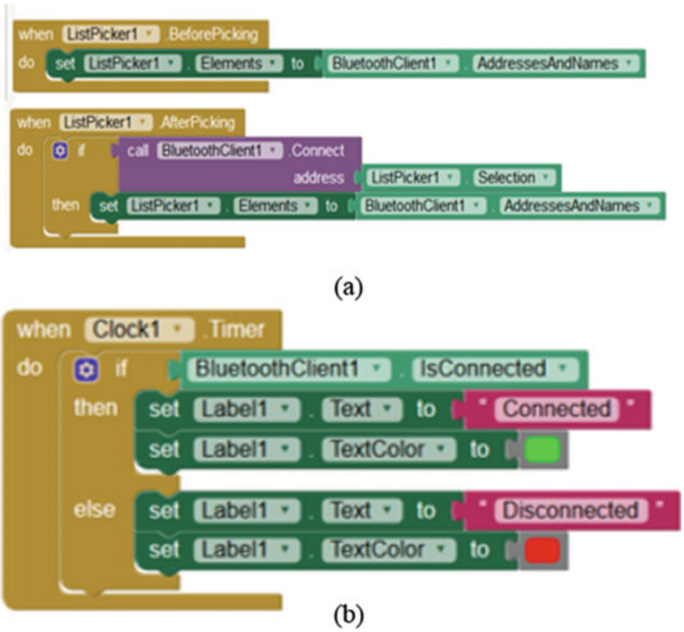


Fig. 5 Application BLOCK CODE **a** Connects Bluetooth to the tool and **b** receiving data from Bluetooth

3.1 Bluetooth Connectivity Distance Testing to Turn on the Engine on a Motorcycle

This test is done to find out how much the maximum distance that can be done to be able to connect between Bluetooth to turn on the motorcycle engine. Testing is done by turning on the circuit switch to turn on the appliance and trying to connect between the Bluetooth module and Bluetooth on the handphone. The results of this test can be seen in Table 1.

Table 1 Testing for Bluetooth connectivity to turn on the engine

Height (METER)	Testing	Connected	Connected	Not connected	Success	
Delay Time						
2	10	Connected	10	–	100%	1 s
5	10	Connected	10	–	100%	1 s
6	10	Connected	10	–	100%	1 s
8	10	Connected	–	10	–	–
9	10	Connected	–	10	–	–

Table 2 Testing for Bluetooth connectivity to turn on the engine

Length (Meter)	Testing	Connected	Connected	Not Connected	Success	Delay Time
2	10	Connected	10	–	100%	1 s
4	10	Connected	10	–	100%	1 s
6	10	Connected	10	–	100%	1 s
7	10	Connected	10	–	100%	1 s
9	10	Connected	10	–	100%	1 s
10	10	Connected	7	3	70%	1 s
12	10	Connected	–	10	–	–
13	10	Connected	–	10	–	–

From this distance test, the results are obtained where the Bluetooth connection to turn on the engine on the motorbike will function properly at a distance of 12 meters, besides that at a distance of 13 meters Bluetooth connectivity cannot be connected properly, but Bluetooth is still possible to connect. The Bluetooth connection will not be able to connect if the distance between the user and the motorcycle is more than 13 meters.

From Table 2, it can be seen how the results of the connection between Bluetooth and controller to turn on a motorcycle engine with a certain distance, the results will be obtained where the Bluetooth connection will be connected properly at a distance of 9 meters. In this test, the barrier used is in the form of a wall with a height of 2.5 meters and has a wall thickness of 11 cm. With this barrier, the ability of the Bluetooth connection to be connected becomes reduced.

From the tests that have been carried out in Tables 1 and 2, then in Table 3, we can see how the connection between Bluetooth and controller with a certain height range with the position of the smartphone vertically aligned with the motorcycle. In

Table 3 Testing for Bluetooth connectivity to turn on the engine

Length (Meter)	Testing	Connected	Connected	Not Connected	Success	Delay Time
2	10	Connected	10	–	100%	1 s
4	10	Connected	10	–	100%	1 s
6	10	Connected	10	–	100%	1 s
7	10	Connected	10	–	100%	1 s
9	10	Connected	10	–	100%	1 s
10	10	Connected	10	–	100%	1 s
12	10	Connected	10	–	100%	1 s
13	10	Connected	6	4	60%	1 s
14	10	Connected	–	10	–	–
15	10	Connected	–	10	–	–

Table 4 Bluetooth connectivity testing to turn on the engine from height

Length (Meter)	Testing	Connected	Connected	Not Connected	Success	Delay Time
2	10	Connected	10	–	100%	1 s
4	10	Connected	10	–	100%	1 s
7	10	Connected	10	–	100%	1 s
9	10	Connected	10	–	100%	1 s
10	10	Connected	10	–	100%	1 s
12	10	Connected	10	–	100%	1 s
13	10	Connected	6	4	60%	1 s
15	10	Connected	–	10	–	–

this test Bluetooth can be connected properly at an altitude of 6 meters and has no connection at a distance of 8 meters.

3.2 Bluetooth Connectivity Distance Testing to Turn off the Engine on a Motorcycle

This test is done to find out how much the maximum distance that can be done to be able to connect between Bluetooth to turn off the motorcycle engine. In Table 4, the test is done by turning off the relay on the controller which aims to turn off the motorcycle while it is on.

In Table 4, it can be seen how the connectivity based on different distances to turn off the motorcycle engine can run well. From this distance testing, the results are obtained where the Bluetooth connection to turn off the engine on the motorbike will function properly at a distance of 12 meters without any obstacles.

From Table 5, it can be seen how the results of the connection between Bluetooth and the controller to ensure a motorcycle engine with a certain distance is obtained where the Bluetooth connection will be connected properly at a distance of 9 meters if there is a barrier between the smartphone and controller. In this test, the barrier used is in the form of a wall with a height of 2.5 meters and has a wall thickness

Table 5 Bluetooth connectivity testing to turn on the engine from height

Length (Meter)	Testing	Connected	Connected	Not connected	Success	Delay time
2	10	Connected	10	–	100%	1 s
5	10	Connected	10	–	100%	1 s
6	10	Connected	10	–	100%	1 s
8	10	Connected	–	10	–	–
9	10	Connected	–	10	–	–

Table 6 Bluetooth connectivity testing to turn on the engine from height

Length (Meter)	Testing	Connected	Connected	Not Connected	Success	Delay Time
2	10	Connected	10	–	100%	1 s
4	10	Connected	10	–	100%	1 s
6	10	Connected	10	–	100%	1 s
7	10	Connected	10	–	100%	1 s
9	10	Connected	10	–	100%	1 s
10	10	Connected	7	3	70%	1 s
12	10	Connected	–	10	–	–

of 11 cm. With this barrier, the ability of the Bluetooth connection to be connected becomes reduced.

From the test in Table 6 above, the connection between Bluetooth and controller with a certain height range is obtained where the Bluetooth connection that is enabled to turn off the motorcycle engine will be connected properly at an altitude of 6 m. This test is carried out at altitude and is parallel to the motorbike below; the results of this test can be seen in Table 4.6, but Bluetooth cannot be connected to the controller if the smartphone is at an altitude of more than 7 m.

4 Conclusion

Based on the results of testing that has been done on the security system at this motorbike, system can be controlled properly according to the specified distance. This system works with relay switching schemes which can be activated via a microcontroller using Bluetooth on the smartphone. The results of the tests that have been done have shown that the system has been able to work according to the scheme designed with the maximum distance of communication between smartphones and motorbikes via Bluetooth media which is ± 12 m. Therefore, with the use of this system, the level of vehicle safety can be increased.

References

1. A. Septryanti, F. Fitriyanti, Rancang Bangun Aplikasi Kunci Pintu Otomatis Berbasis Mikrokontroler Arduino Menggunakan Smartphone Android. Comput. Eng. Sci. Syst. J. **2**(2), 59–63 (2017)
2. P. Faruki et al., Android security: a survey of issues, malware penetration, and defenses. IEEE Commun. Surv. tutorials **17**(2), 998–1022 (2014)
3. Y. Arta, E.A. Kadir, D. Suryani, KNOPPIX: parallel computer design and results comparison speed analysis used AMDAHL theory, in *Information and Communication Technology (ICoICT), 2016 4th International Conference on*, 2016, pp. 1–5

4. W. Enck, M. Ongtang, P. McDaniel, Understanding android security. IEEE Secur. Priv. **7**(1), 50–57 (2009)
5. N. Jinaporn, S. Wisadsud, P. Nakonrat, and A. Suriya, Security system against asset theft by using radio frequency identification technology, in *2008 5th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology*, 2008, vol. 2, pp. 761–764
6. M. Banzi, M. Shiloh, *Getting Started with Arduino: the Open Source Electronics Prototyping Platform* (Maker Media, Inc., 2014)
7. Y.A. Badamasi, The working principle of an Arduino, in *2014 11th International Conference on Electronics, Computer and Computation (ICECCO)*, 2014, pp. 1–4
8. S.F. Barrett, *Arduino Microcontroller Processing for Everyone!* (Morgan and Claypool Publishers, 2010)
9. M. Syahwil, Panduan Mudah Simulasi dan Praktek Mikrokontroler Arduino, Yogyakarta Penerbit Andi (2013)
10. D.A. Prasetyo, Perancangan Dan Pembuatan Alat Pengendali Kendaraan Roda Dua Berbasis Android (2016)